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APPENDIX VERMIFORMIS:  
ANATOMICAL AND CLINI-  
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BY

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## NOTES ON THE APPENDIX VERMIFORMIS : ANATOMICAL AND CLINICAL.

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No explanation is necessary for the selection of the subject I bring before you. The importance of the subject may be seen by a perusal of current medical literature, in the number of articles and reports of society proceedings bearing on it.

Some apology may be due you for the form in which the matter is presented. I advance no theories and bring out no conclusions. But this is rendered necessary by the nature of the subject. The typical cases of appendix disease are well known to all, promptly diagnosed, and treated for the most part rationally. But we are becoming familiar with the fact that in a considerable proportion of cases of appendix disease the symptoms are vague, and that owing to this lives are lost even to the most progressive. With the increase in knowledge, these cases are becoming rarer, but are common enough for all who have opportunities for making autopsies to see examples all too frequently.

For some years I have endeavored to gain some light by a study of the anatomical relations of the appendix. Although the number of examinations reported is small, it must be remembered that some of the most useful studies of the appendix have been made on small groups of cases. One reason for reporting the observations at this time is that opportunities for carrying on the observations are wanting.

In the course of the observations, I met with a number of cases presenting interesting clinical points. These I shall mention briefly.

I pass over a number of cases of disease of the appendix or its vicinity treated as such, either internally or by surgical means, and in which, by their course, or the result of operation, one or other of the common forms of appendix disease was made out.



Most of the observations were made in Galveston, Texas, in hospital and private practice. The number of bodies examined was 80.

A large majority were beyond the age at which appendix disease usually develops.

Seven were below the age of 21, *i. e.*: two of 3 years, one each of 5, 14, 16, 18, 20; between 21 and 25, 5; 26 to 30, 9; 31 to 35, 7; 36 to 40, 9; 41 to 45, 10; 46 to 50, 10; 51 to 56, 5; 56 to 60, 9; 61 to 65, 3; 66 to 70, 1; 71 to 75, 4; very old, age unknown, 1. Sixty-five were white, fourteen negro, one Mexican. There were 70 males and 10 females.

The peculiar conditions as to age and sex are common in hospitals in the south.

The position of the appendix was carefully noted before any of the organs were moved. In 47 cases it was in that called normal—lying among the folds of the small intestines, or behind the mesentery, and pointing towards the position of the spleen.

In 8 cases it lay in the right iliac fossa. In 8 cases it lay near this position, noted as in the vicinity of the right sacro-iliac articulation, or the lumbo-sacral articulation. In 4 cases, it lay to the left of the ascending colon and running up towards the liver; in 4 to the right of and close to the ascending colon.

In 6 cases it was quite in the true pelvis. In one of these, in a case of chronic dysentery, the cæcum was adherent in the pelvis.

In one case, the appendix ran horizontally back from a cæcum rather turned towards the ~~anterior~~ abdominal wall.

In one, the appendix, four inches long, ran to the left straight across from the cæcum, ending among the coils of small intestines.

In one, it ran along the iliac vessels to the right pubic spine.

The length of the organ was not noted in every case, but always where longer or shorter than a medium of 3 to 4 inches. In two cases it measured only 1 inch, one in a white male of 30, the other in a white male of 51. The largest measured 7 inches, in a white male of 35. The average length in negroes is probably slightly greater than in whites—4 inches in my cases, but great variations were not so common.

The diameter showed no great variation from an average of 5



mm. In a case of tuberculous ulceration of the intestines, with tuberculous ulcers in the appendix, that organ had a diameter of 15 cm.

#### PATHOLOGICAL CONDITIONS.

No attempt was made to look for microscopical changes in the absence of manifest lesions, although an experience recorded in a case operated on by Dr. Hadra, (Medical Record, Vol. I, 1890, p. 269,) makes it probable that such changes could often be found.

In five cases there was evidence of disease in the form of adhesions of the peritoneum of the appendix to adjacent structures, without greater lesions.

Case I. (XXI.) Man of 25 years, died of typhoid fever. Appendix in the right iliac fossa adherent to the cæcum for three inches, one inch free. It contained no Peyer's patches; the lymph nodules were swollen, but not ulcerated. There was no evidence of disease in the cæcum. The adhesions were firm and smooth, apparently old.

Case II should not, probably, be included. The subject (XXVIII,) was a man dead of phthisis, with lesions of the ileum and small (tuberculous) ulcers in the mucous membrane of the appendix. The appendix, the size of the little finger, was closely adherent to the left side of the colon. There was beginning inflammation over some of the ulcers in the appendix, but the adhesions were evidently of long duration.

Case III. Croupous pneumonia in a man of 60 years, (XLVI.) Appendix 6 inches long, adherent in its whole length to the peritoneum to the left of the ascending colon. There was no other evidence of appendix, or cæcal disease.

Case IV. In the body of a negro of about 50, dead of chronic nephritis, (contracted kidney, hypertrophy of left ventricle and atheroma), the appendix, 5 inches long, was closely adherent to the peritoneum, along the right side of the ascending colon. The adhesions were so firm, close, and smooth that the organ could only be found with some difficulty, after raising the caecum and loosening some of the adhesions. The obscurity was increased by the opacity of the peritoneum (ascites.)

Case V. Man of 63, dead of pyæmia, following extensive

crushing, the appendix, 5 inches long, lay close to the right side of the ascending colon, attached by thin but firm adhesions. No other peritoneal lesion.

In a case of typhoid fever, fatal in the third week, there was extensive redness and swelling of the serosa of the appendix, along with swelling of mucous membrane and solitary nodules.

#### FOREIGN BODIES.

In no case was a true foreign body found: that is, one of external origin.

In case LVII, a man of 23, dead of pernicious malarial fever, without history of other disease, a fæcal concretion was found. The appendix, 4 inches long and as thick as a lead pencil, ran across toward the promontory, lying among loops of small intestines. About an inch from the tip, in a small dilatation, lay a hard smooth mass, the size and shape of a prune stone, for which it was taken until cut out. It was made up of dry fecal matter, with a thin, moist, pale yellow coating, and a hard center, resembling a grain of sand.

In one case a mucous plug was found. This was in the body of a negro woman of about 20 years, (Case LXIX.) The patient died suddenly soon after admission to the hospital. There was general anasarca. The only history obtainable was that the patient had been in the same condition for some months. The cause of death was contracted kidney of severe degree.

The appendix was three inches long, lying curled below the cæcum. The intestines showed no lesion. The appendix was filled by a mass of greenish yellow, tough, gum-like material, resembling to the naked eye and microscopically some kinds of casts passed in membranous enteritis. It was so closely impacted that a probe could not be passed through between the mass and the mucous membrane. In the beginning of the appendix, the mucous membrane showed no naked eye change. Towards the tip it was dense and white.

Sections showed: Thickening of the peritoneum of the appendix and its mesentery, with fibroid thickening of the mesenteric arteries (adventitia). The muscularis was but little altered, the submucous coat fibroid, and closely united with the fibroid muscularis mucosæ. The tubules of the mucous mem-



brane were not more than half the usual depth, and separated by wide spaces filled with small-celled or fibrous granulation tissue. The epithelial cells appeared mostly as goblet cells. The mass filling the lumen of the appendix was continuous with the colloid contents of the tubules. The process was more marked at the distal end.

Here the plug of altered mucous was precisely like the harder "casts" passed in cases of membranous enteritis. It might be supposed that the plug was the cause of the disease in the appendix. It is more likely, however, that the latter represented the later stages of a severe appendicitis, and that the mucous remaining in the lumen, on account of the rigidity of the walls, became altered in its consistency and appearance. The appendix was probably no longer dangerous, but we can hardly doubt that its possessor had passed through a dangerous condition at some former period.

#### OCCLUSION OF APPENDIX.

This was found in the body of a man of 72, dying of phthisis of many years' duration. The patient had been under the care of Dr. Breakey for a long time, more recently under that of Dr. Wessinger. No history of appendix disease was known.

The appendix was two inches long, hanging down into the pelvis. The proximal half was converted into an impervious cord not quite one-eighth inch thick. The distal end was slightly thicker, but not dilated; the coats fibrous-looking.

This shows eight cases, or 10 per centum of appendices, with marked evidences of disease, or abnormal contents. It would be much more valuable if we could know the histories of the cases, and it is to be hoped that in future a more careful search for the remains of disease in those who recover from appendicitis will be made.

These cases may be used in statistics in connection with others, and it is hoped their publication will serve a purpose.

The following cases are reported as additions to the natural history of appendix disease:

#### RECURRING APPENDIX DISEASE MISTAKEN FOR OSTEO-SARCOMA.

Correct diagnosis at second attack; operation; recovery; death three months later from obstruction of intestines.

The patient, J. Sch., æt. 40, came under my care in September, 1890, while temporarily in charge of the surgical wards of a colleague. The patient was admitted for retention of urine, to which he was subject as the result of old stricture of urethra. On rectal examination, the prostate was found enlarged, especially on the right side. The stricture was not very tight. Under the use of alkalies, with catheterization, the symptoms were soon relieved. About this time a swelling appeared in the right inguinal region. It was first discovered deep down, just beneath the middle of Poupart's ligament, being found during catheterization, though there was no evidence of it by the rectum. Gradually the swelling became more superficial, and finally redness of the skin and slight softening appeared.

There were no constitutional symptoms, other than those, already much milder, which accompanied the retention. The patient said he had had a similar attack a year before and recovered spontaneously. As the swelling had no connection with the prostate, I concluded it must be of appendicular origin. At that time my colleague returned, and as soon as he saw the patient said he remembered him well, and that he had a sarcoma of the pelvis. On expressing my surprise, he showed the case book, by which it appeared that, a year before, the man had been admitted in a similar condition. A consultation was then held, the man examined under chloroform, a diagnosis of osteo-sarcoma made, and the patient discharged, an operation being considered inadvisable. The swelling soon disappeared, leaving no trace the patient could discover.

An examination soon made it clear to my colleague that the mass we had then to deal with contained fluid. Under chloroform, an incision was made parallel to, and just above, Poupart's ligament, and a large quantity of fæcal-stinking pus and tissue debris evacuated. The cavity was separated from that of the abdomen by a firm wall, apparently more than half an inch thick. The whole cavity was lined by granulation tissue. There was no fecal matter in the pus, and though the suspicion of appendix disease was greatly strengthened it was considered better not to explore for it at that time.

The cavity was washed out and packed and in a few days healed up and the man was discharged.



Three months later, December 26, 1890, the patient was admitted, late at night, to the Sealy Hospital. The patient was almost in collapse, with evidences of peritonitis and history pointing to obstruction of the intestines for four days. Dr. Hadra made abdominal section and found general peritonitis, with a small quantity of pus in the recto-vesical space and pus and fibrin flakes between the coils of intestines. The cause of the obstruction was a long tense omental band, adherent to the anterior abdominal wall, low down on the right side, with a number of loops of small intestine tightly caught and turned sharply over it. There were several adhesions between loops of intestines. The band was cut off short and ligated, the adhesions loosened, and the abdominal cavity thoroughly flushed out with hot water. The appendix was looked for but could not be found. The abdomen was closed. No one at the operation knew the patient's previous history, and the patient himself was unable to give it. Four hours after the operation the patient died.

Next morning, I was called in to make the autopsy and at once recognized the man. The scar of the old operation was quite narrow and pale. The peritoneum showed traces of severe inflammation everywhere. Four feet of ileum just above the valve were almost black, swollen, the mucous membrane thick and gelatinous. The cæcum was in the usual position, but fastened down to the end by firm adhesions so smooth that it seemed as if the cæcum was not entirely surrounded by peritoneum. The appendix could not be found at first, but on raising up the cæcum and breaking the new formed covering, it was found lying close to the iliac vessels and ending at the right pubic spine, to the connective tissue behind which it was adherent and could be separated with difficulty. The whole appendix was covered with a layer so smooth as to make it seem as though the organ was behind the peritoneum. This was all the more confusing from the general peritonitis which marked the opacity of the investment. The walls of the appendix were thick and rigid. The tip was curled downwards for half an inch beyond the adhesion to the pubis, and at the extreme end was a fine opening, through which a thin whitish fluid could be pressed. The opening was beneath the peritoneum and led into a fine sinus which

could be traced down to the bottom of the pelvis. The peritoneum on the lower pelvic wall, from the crest of the pubis to the bottom, was thick and closely adherent to the dense cicatricial connective tissue which indicated the site of the abscess opened three months before. The bladder was adherent to the pelvic peritoneum on the right side, and to the rectum by old adhesions. The prostate was examined to see if the abscess had any connection with it, with negative results. It showed cicatricial remains in both lateral lobes, especially the right. There was a stricture of large calibre in the middle of the penile part of the urethra and another in the membranous part.

The appendix was empty, save a small quantity of thin, whitish fluid. Its walls presented an appearance much resembling that in the case of mucous plug, indicating inflammation affecting all the coats. The other organs in the body presented no changes bearing on the case.

This seems to me a peculiarly instructive case of recurring appendicitis. The fatal end was of course an indirect one, from the adherent omentum, yet it cannot be doubted that the patient was constantly threatened with general peritonitis originating from the appendix. An operation in a period of quiescence, with removal of the appendix and search for and removal of omental adhesions, which should always be suspected, might have entirely prevented further trouble.

The next case was one with more familiar features, but presents interesting diagnostic and therapeutic aspects.

Began as a case of catarrhal enteritis, with mucous and slightly bloody stools, following the eating of a large quantity of grapes. Under treatment this improved, but became worse again and vomiting began. Soon after this, I first saw the patient. She had vomited everything swallowed for some hours, iced champagne included. The patient moved freely about the bed, the mind was clear and cheerful; face slightly flushed, temperature  $101^{\circ}$ . The patient complained only of vomiting, and pain in the left side under the false ribs. The abdomen was soft, not distended. Pressure was well borne everywhere except just over the position of the lower end of the spleen, and in the epigastrium; there was no increased resistance at any point.



The tongue was red, the papillæ enlarged. There had been no stool for about twelve hours.

Appendicitis had been suspected from the beginning, but there seemed not sufficient evidence of it. The vomiting impressed me as that of peritonitis. Small doses of calomel were given. The vomiting ceased and the patient slept well. In the following morning the vomiting began again, the temperature rose to  $102.8^{\circ}$ , higher than it had been at any time before. About noon the patient complained of sudden pain below the umbilicus, the temperature fell, the extremities became cool, and the patient went rapidly into collapse, with delirium, and died three hours later.

At the autopsy, was found general peritonitis, with about half a pint of thin, whitish pus and fibrin flakes between the coils of intestine.

The appendix lay along the brim of the pelvis, its serous covering red and with a patch of firm fibrin over the distal end.

The cæcum was normal. About a foot above the valve the adjacent surfaces of a loop of ileum were found adherent. On separating this, a necrotic area, almost black, about the size of a dime, was found. The colon just below the splenic flexure showed a similar spot, corresponding to another on the surface of the small intestine lying in contact with it. In these places, as in the rest of the small and large intestines, the mucous membrane was intact. Examining the appendix from the outside, without removing the fibrin flake, one would not suspect serious lesion. The orifice was patulous. On cutting the appendix open, a small transverse whitish slough in the mucous membrane was found near the end, and in the bottom of the slough, covered on the outside by the fibrin, though not tightly, was a perforation the size of a small pin's head.

Without an autopsy it might have been supposed that this was a case of peritonitis due to infection through a diseased, but not perforated, gut wall. That the perforation in the appendix was the point of exit can, however, not be doubted, and though remarkable for the absence of some of the commonest symptoms of appendicitis, the case is not unique. I am quite certain that in another case, almost precisely like the one described, the

conditions were the same, but neither operation nor autopsy could be obtained, so that the supposition could not be confirmed.

Cases of this kind, with sudden alarming symptoms, raise the question whether it is not our duty to operate. Without this the issue is hopeless, and although in most cases, by the time an operation could be made, the collapse is so great as to make all efforts futile, there is reason to believe that operations by experienced surgeons would occasionally save life.

#### PERITONITIS FROM LIGATION OF THE APPENDIX.

The common practice of ligating the appendix has always seemed to me wrong in theory, and an observation not included among the first eighty cases hardens me in that belief.

The idea seems to be that, when the appendix is ligated, and the end beyond the ligature cauterized or otherwise sterilized, the stump will cicatrize and the end either come away and be absorbed or its nutrition will be kept up by new-formed vessels from the proximal part. No doubt if the mucous membrane were separated perfectly, as the inner coats of the artery were supposed to be in ligation, or if the adjacent mucous surfaces ulcerated and became adherent, this mode of healing might take place. But it seems to me that there is considerable doubt in any given case whether such a result will occur. If the perfect occlusion did not take place, we would have the risk of infectious material passing out into the peritoneum. When I have mentioned these misgivings to surgeons, I have been pointed to the common practice in treating the stump in ovariectomies, even when the tubes are ligated. But the tubes seldom contain such numbers of virulent micro-organisms as the intestine does.

The case in point was one in which laparotomy was done for ovarian tumor. The appendix was closely adherent to the growth, was torn in loosening it and was ligated after thorough sterilization of the end. The woman did well for nearly a week and then died a few minutes after the occurrence of pain in the heart region and left shoulder, with feeling of suffocation. The cause of this was found on autopsy to be a recent thrombus in the right coronary artery, due to extensive atheroma. (It was afterwards learned that the woman had had similar anginous attacks, at long intervals. There was no evidence of heart lesion before death.)



The laparotomy wound and the seat of the operation were in perfect condition, with healing far advanced.

The stump of the appendix was in contact with the lower part of the rectum. Around it was about 1 c. c. of yellow pus, which was removed and covers made at once for staining. The ligature (catgut) had ulcerated into the mucous membrane for about 4 mm. There was no attempt at covering over the ligature by exudation from the serosa. The pus contained large numbers of bacteria, including four kinds of bacilli, one of which was probably the common colon bacillus. At any rate the variety of forms makes it certain that the organisms came from the intestine, and were not introduced at the operation.

Owing to the accidental death, the infection was of no consequence. Had the patient lived longer, she would have had general peritonitis, most probably (there were no limiting adhesions), or at best circumscribed suppuration, with rupture into the rectum and the suspicion of infection at the operation.



















